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(57) Abstract

A communication system is provided in which the routing of data through a communications switch is controlled by a telephone management system (17). The telephone management system (17) is arranged to receive signals indicative of the origin, requested destination and status of a communication from the switch and signals indicative of the current time and then to select from a database (29) a record indicating configuration data to be output to the switch, the record being selected on the basis of the received inputs. Users then control the routing of communications through the switch by updating the records in the database (29) via a user interface module (33) which outputs a user interface to prompt users to enter rules in a predefined format. The user inputs are then passed to a conversion module (37) which converts input user data into a format for storing as a record in the rules database (29). By providing means for accessing the user interface module (33) remotely, users can amend the way in which communications are routed through the switch in real time.

TOM'S RULES ~ 200

1 if NICK calls 12 OCT 1999 ANYTIME ~ 202

try BUSY SIGNAL for EVER else ☐

2 if DAVID calls MONDAY MORNING ~ 202

try MY MOBILE for 10 S else 3

3 if DAVID calls MONDAY MORNING ~ 202

try MY HOME for EVER else ☐ 202

4 if 0171 739 0000 calls MONDAY BETWEEN 12:00 AND 13:00

try MY MOBILE for 5 S else ☐

5 if ANYONE calls MONDAY ANYTIME ~ 202

try MY PHONE for 10 S else ☐

default if ANYONE calls ANYDAY ANYTIME ~ 203

try VOICEMAIL 1 for EVER

205 207 209 213 211

INSERT RULE DELETE RULE SORT RULE UPDATE RULE

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## COMMUNICATIONS SYSTEM

The present invention relates to an apparatus and method for controlling the routing of communications through a communications switch. Embodiments of the present invention relate to an apparatus and method for controlling the routing of telephone calls through a private branch exchange or through public switching telephone network switches.

When a telephone call is received by a private branch exchange or a switch of a public telephone switching network, the call is routed either to another switch or to a telephone. The routing of the telephone call is determined by the number which the caller enters when making the telephone call. In the case of a private branch exchange, this can be set up so that it diverts the telephone call to a voice mailbox if it is not answered within a set time period.

In known telecommunication systems, the choice of how calls may be diverted is often very limited and the variation of a destination for a telephone call is usually restricted to either changes made by a system administrator or very limited changes made through touch tone phones.

The present invention aims to provide a telephone management system in which a greater variety of telephone routing choices may be provided and in which users can update their own preferences for the routing of telephone calls in real time. In this way the difficulties arising from the delays inherent in having to instruct a system administrator to update routing preferences are avoided.

In accordance with one aspect of the present invention there is provided a telephone management system arranged to receive caller ID data, requested destination data and  
5 time and date data; and means for generating and outputting configuration data in accordance with one or more of received inputs and wherein said generation means comprises a user preference database associating combinations of inputs with configuration data, said  
10 database being updatable by users of the system.

In accordance with one embodiment of the present invention a telephony management system is provided in which a telephone management module is arranged to  
15 monitor the progress of calls through a private branch exchange and to output configuration data utilising status data received from said private branch exchange.

In another embodiment of the present invention a  
20 telephony management system is provided which is arranged to receive data from the switch within a public telephone switching network.

Further embodiments and aspects of the present invention  
25 will become apparent from the following embodiments which are described with reference to the accompanying Figures in which:

Figure 1 is a block diagram of a telephone network  
30 including a telephone management system embodying the present invention;

Figure 2 is a block diagram illustrating the main components of the telephone management system shown in Figure 1;

5 Figure 3 is a block diagram illustrating the preferred data structure for storing user rules in a rules database of the management system shown in Figure 2;

10 Figure 4 is a block diagram illustrating the preferred data structure for storing telephone book entries in a user telephone book database of the management system shown in Figure 2;

15 Figure 5 is a block diagram of an example of data stored in a conversion dictionary database which forms part of the management system shown in Figure 2;

20 Figure 6 is an exemplary illustration of an initial user interface which allows a user to select the user's telephone book or user rules for updating;

25 Figure 7 is an illustration of an exemplary user interface which allows the user to amend the user's telephone book entries;

Figure 8 is an illustration of an exemplary user interface which allows the user to input and amend user rules;

30 Figure 9 is a flow diagram illustrating the processing steps used by the telephone management system of Figure 2 to control the routing of a call through a private branch exchange;

Figure 10 is a timing diagram illustrating the signalling between the public switching telephone network, the private branch exchange and the telephone management system of Figure 1 when an incoming call is routed to a first destination and then is routed to a second destination when no answer is received from the first destination;

Figure 11 is a timing diagram illustrating the signalling between the public switching telephone network, the private branch exchange and the telephone management system of Figure 1 when an incoming call is routed to a first destination and then is transferred to a second destination when the first destination is busy; and

Figure 12 is a block diagram of a second telephone system embodying the present invention.

Figure 1 is a block diagram of a telephone network, which comprises an office communications network 1 that is connected to a public switching telephone network 3 (hereinafter referred to as a PSTN). The PSTN 3 is also connected to a number of callers telephones 5, a number of mobile telephones 7 and home telephones 9 of workers in the office.

The office communications network 1 comprises a private branch exchange 11 (hereinafter referred to as a PBX) which is connected to the PSTN 3. The PBX 11 is also connected to a number of office telephones 13 and a number of voice mail boxes 15. The PBX 11 is arranged to route telephone calls from the office telephones 13 either to other office telephones 13, to voice mail boxes 15 or to the PSTN 3 for connection to telephones outside



of the office such as the caller telephones 5, the mobile telephones 7 and the home telephones 9. The PBX 11 is also arranged to route incoming telephone calls received from telephones outside of the office via the PSTN 3 to the office telephones 13, to the voice mail boxes 15 or alternatively to designated telephones outside of the office via the PSTN 3. The exact routing carried out by the PBX for a current incoming call is determined from signalling information received from the PSTN 3 prior to the call being set up (which includes the caller's ID, i.e. the telephone number of the caller, and the destination telephone number) and the current configuration of the PBX 11.

15 In this embodiment, the telephone management system 17 is operable to control the routing of incoming calls through the PBX 11 in accordance with a set of user defined rules. In particular, each user in the office can programme the telephone management system 17 via a personal computer (PC) 19 and the local area network (LAN) 21 with user routing instructions identifying how the user wishes his incoming calls to be routed. For example, if a user is currently working at PC 19-1, then he can programme the telephone management system 17 to ensure that all calls received for him are routed to the office telephone 13-1 which is in the vicinity of the PC 19-1. Additionally, the user can programme the telephone management system 17 to ensure that calls from one or more specified callers are routed to voice mail 15 or are given a busy tone. Alternatively, if the user is out of the office then he may programme the telephone management system 17 to ensure that calls received from specified individuals are routed through the PBX 11 to the user's mobile telephone 7-1 whilst incoming calls from other

individuals are routed to voice mail 15. In this way, each of the office workers can control the routing of their incoming calls through the PBX 11.

- 5 A brief description of the way in which this is achieved will now be described. When a caller places a call to one of the users the PSTN 3 sends signalling information to the PBX 11, which signalling information identifies the callers ID and the destination telephone number. As  
10 with most PBX switches, there is a delay between receiving this signalling information and setting up the call to an appropriate telephone or voice mail. During this delay, the telephone management system 17 monitors the received signalling information and retrieves  
15 routing instructions programmed in by the user who is associated with the destination number contained within the signalling information. These routing instructions identify the user set destination for the incoming call and, in response the telephone management system 17  
20 reconfigures the PBX 11 so that it will route the call to the desired telephone or voice mail.

- The way in which the users can program the telephone management system 17 to control the routing of incoming  
25 calls will now be described in more detail. In accordance with this embodiment of the present invention, initially a user downloads user interfaces from the telephone management system 17 via the LAN 21 into any of the PCs 19. The user then enters via the user interfaces  
30 displayed on the screen of the PC 19, data relating to how they wish their telephone calls to be routed. This data is then sent from the PC 19 via the LAN 21 to the telephone management system 17. The telephone management system 17 then converts the received data and stores the

converted data as a user record for later use. If the user wishes to amend the way in which their calls are routed, then they can download the user interfaces from the telephone management system 17, via the LAN 21 into  
5 their PC 19 once again and amend their user records stored within the telephone management system 17.

In this embodiment the user interfaces stored within the telephone management system 17 which can be downloaded  
10 into the personal computers 19 via the LAN 21, provide a well defined way of allowing users to input rules for controlling the call routing process. This ensures that rules exist to deal with all situations. The routing of calls by the PBX 11 can then be controlled in real time  
15 by the telephone management system 17 by providing a real time access database which stores records of these user rules in a manner which can be rapidly retrieved and processed to generate configuration data for configuring the PBX 11 so that it routes the incoming call in the  
20 desired manner.

Figure 2 is a block diagram showing in more detail the main components of the telephone management system 17 of Figure 1. As shown, the telephone management system 17  
25 comprises a call routing system 25 that is arranged to receive the signalling information received from the PSTN 3 which includes the destination telephone number and the caller ID. The call routing system 25 is also arranged to receive status data from the PBX 11 so that it can  
30 monitor the progress of telephone calls routed through the PBX 11 and so that it can send appropriate call logging data to a call logging database 31 for administrative and billing purposes. Also connected to the call routing system 25 is a real time clock 27 which

provides the current time, date and day. The call routing system 25 is also connected to a rules database 29 which stores the above mentioned user records which identify how incoming calls for the users are to be routed by the PBX 11.

Figure 3 illustrates a preferred form of a user record stored within the rules database 29. As shown, each of the user records comprises a record number 70; a user ID 72 indicative of the destination to which the record applies; a caller ID 74 indicative of the callers to whom the record applies; a time frame 76 indicative the period of time during which the record is to be used; a required action 78 indicative of the output which is to be generated by the call routing system 25 and sent as configuration data to the PBX 11; time-out data 80 indicative of the period before a next user record is used to generate another output; and next record data 82 indicative of the record number 70 of the next record to be used to generate configuration data if the current rule is unsuccessful within the time-out period 80.

Returning to the description of the call routing system 25 shown in Figure 2, when the call routing system 25 receives the signalling information it retrieves a user record from the rules database 29 on the basis of the destination telephone number, the caller ID, the status data received from the PBX 11 and the time, day and date received from the clock 27. The call routing system 25 then extracts the required control action 78 from the retrieved user record and outputs appropriate configuration data to the PBX 11 so that it will route the call in the desired manner and records the time when this configuration data is output.

In the event that the call is not answered at the specified destination within the time out period 80 (which will be determined from the status data received from the PBX 11), then the call routing system 25  
5 retrieves the next record 82 from the rules database 29 so that a new control action (such as a new destination telephone) can be identified. The call routing system 25 then sends new configuration data to the PBX 11 so that the call is routed to the new destination telephone or so  
10 that the PBX 11 performs the required routing operation and records the time and the output of the new configuration data.

Whilst a telephone call is being made, the call routing  
15 system continues to monitor the status data for the call received by the PBX 11, until the call ends. The call routing system 25 then transfers a record of its processing of the call and the duration of the call to the call logging database 31 connected to the call  
20 routing system 25. In this way a record of the processing of calls is generated. Furthermore, in this embodiment, as the origin, destination and duration of calls are logged together, the call logging database provides a record of calls for the purposes of billing.

25 As shown in Figure 2, the telephone management system 17 also comprises a user interface module 33 that provides a downloadable user interface which allows users to access and change their user records stored in the rules  
30 database 29. In this embodiment the user interface module 33 also allows users to access the contents of the call logging database 31 so that the user can check that incoming calls have been dealt with in the correct manner. The user interface module 33 also allows users

to modify or add entries to their telephone book which is stored in the telephone book database 35. As will be described below, the telephone book allows users to identify callers and required destinations of incoming calls using names rather than telephone numbers.

Figure 4 illustrates a preferred form of a telephone book stored within the user telephone book database 35. As shown, the telephone book comprises a user name 42, a user telephone number 43, a user ID number 44, and a number of telephone book entries 45. Each of the telephone book entries 45 comprises a name 46 and a number 47. Initially when a user telephone book is created it comprises only the user name 42, the user telephone number 43 and the user ID 44 of the user associated with the telephone book. Telephone book entries 45 are then added to the telephone book when a user logs on to the telephone management system 17 via a PC 19, the LAN 21 and the user interface module 33 as will be described later.

As mentioned above, the user interface module 33 allows users to access and change their user records which are stored in the rules database 29. In this embodiment, a conversion module 37 is provided which converts the user routing instructions input via the user interface module 33 into one or more user records which are stored in the rules database 29 and which are in a format which allows easy access and processing by the call routing system 25. In carrying out this conversion, the conversion module 37 uses a conversion dictionary database 39 and the user's telephone book which is stored in the user telephone book database 35. The conversion module 37 is also arranged to convert user records stored within the rules database

29 into a format for output via the user interface module 33 utilising data stored in the user telephone book database 35 and the conversion dictionary database 39.

5 Figure 5 illustrates the form of the conversion dictionary database 39 used in this embodiment. As shown, the conversion dictionary database 39 comprises a number of entries each comprising input data (in the left hand column) which can be input by the user and  
10 corresponding user record generation data (in the right hand column) which is used to generate the user records within the rules database 29. The entries in the conversion dictionary database 39 comprise an entry 51 for the term "ANY DAY" which is associated with data for  
15 generating seven user records each having a time frame where the day is equal to 1, 2, 3, 4, 5, 6 or 7; an entry 52 for the term "WEEKDAY" which is associated with data for generating five user records where the time frame is equal to 1, 2, 3, 4 or 5; an entry 53 for the term  
20 "WEEKEND" which is associated with data for generating two user records where the day is equal to 6 or 7. The conversion dictionary database 39 also includes seven entries 54-60 each associating a term corresponding to a day of the week with data for generating a user record  
25 where the time frame is equal to the corresponding day numbers. Also included in the conversion dictionary database 39 are entries 61, 62, 63 and 64 for associating the time with the terms "MORNING", "AFTERNOON", "EVENING" and "ANY TIME" with time periods 0:00:00-11:59:00,  
30 12:00:00-17:00:00, 17:00:01-23:59:59 and 0:00-23:59:59 respectively. Also stored within the conversion dictionary database 39 are entries 65, 66 and 67 associating the terms "BUSY SIGNAL", "RING TONE", "NOT AVAILABLE" with data indicating the requirement for

outputting a busy signal, a ring tone or not available signal respectively. Also stored within the conversion dictionary database 39 is an entry 68 for associating the term "ANY ONE" with a wild card data (\*) for caller ID.

5

Returning to Figure 2, The telephone management system 17 also comprises an administration module 41 that is connected to the call logging database 31, the rules database 29 and the user telephone book database 35. The administration module 41 is arranged to retrieve and output records from the call logging database 31 so that the processing of telephone calls by the PBX 11 can be monitored. The administration module 41 is also arranged to enable new telephone books to be created in the user telephone book database 35 and new user records to be created in the rules database 29 and also to enable amendment and deletion of user records in the rules database 29 and telephone books in the telephone book database 35.

20

Initially, when a new user is to be entered onto the telephone management system 17, the administration module 41 is used to create a new user telephone book for that user comprising the name, user ID or password and the telephone number for the new user. At the same time a new user record is generated within the rules database 29 representative of the instruction that whenever a request to route a telephone call to the new user is received by the PBX 11, the call routing system 25 should instruct the PBX 11 to route that telephone call to the new user's telephone and to continue trying to connect the caller to that telephone until either the call is answered or the caller hangs up.

30



After a new user telephone book and user records have been created and stored in the user telephone book database 35 and the rules database 29 respectively, the new user can view or amend his user records and his user telephone book via the user interface module 33. To do this, the user initially connects his PC 19 to the user telephone management system 17 via the LAN 21. This causes the user interface module 33 to generate and transmit an initial user interface to the users PC 19 which is then displayed on the screen of the users PC 19.

Figure 6 is an exemplary illustration of an initial user interface displayed on the screen of user's PC 19. At the top of the screen there is a window 150 for entering a user name. Below this appears a second window 152 for entering the user's ID number. Beneath the user name and user ID windows 150, 152 appear four buttons: an update telephone book button 154, an update rules button 156, a view phonelog button 158 and an exit button 160. Also displayed is a pointer 162. By using a keyboard or a mouse connected to the user's PC 19 a user can control movement of the pointer 162 over this screen so that the user can either select the user name window 150, the user ID window 152, the update telephone book button 154, the update rules button 156, the view phonelog button 158 or the exit button 160.

When the user selects the user name window 150 the keystrokes made by the user on the PC 19 are displayed within the user name window 150. When the user selects the user ID window 152 the keystrokes made by the user on the PC 19 are displayed in the user ID window 152. When the user selects the update telephone book button 154, the update rules button 156 or the view phonelog button

158 this causes a request to be dispatched to the user interface module 33 of the telephone management system 17 to download a further user interface 33 into the personal computer 19. At the same time data representative of the  
5 text appearing within the user name window 150 and the user ID window 152 are also transmitted to the user interface module 33 of the telephone management system 17. If the user selects the exit button 160 the user's connection with the telephone management system 17 via  
10 the LAN 21 is terminated.

If the user interface module 33 receives a request to generate and output a further user interface, the user interface module 33 initially compares the received data  
15 representing the user name and user ID number with user telephone books stored in the user telephone book database 35. If none of the telephone books include a user name 42 and a user ID 44 data identical to the user name and user ID received via the LAN 21, then the user  
20 interface module 33 outputs the initial user interface to the user's PC 19 via the LAN 21 once again to prompt the user to input the correct user name and user ID. In this way an unauthorised user is prevented from gaining access to the databases in the telephone management system 17.

25 If the user interface module 33 determines that there is a user telephone book stored in the user telephone book database 35 that has a user name 42 and a user ID 44 data identical to those received from the PC 19 via the LAN  
30 21, then the user interface module 33 generates and transmits a further user interface to the user for display on the screen of the user's PC 19. The particular user interface which is sent depends upon the request made by the user.

If the user interface module 33 received a request to update the users telephone book then the user interface module 33 transmits an update telephone book interface to the user's PC 19 via the LAN 21. Figure 7 is an illustrative example of an update user telephone book interface. At the top of the screen there is a window 180 in which a selection of the user's telephone book entries are displayed. Next to the window 180 a scroll bar 181 is provided for scrolling through the user's telephone book entries displayed in the window 180. Beneath the window 180 a name window 182 is displayed and beneath the name window a number window 184 is displayed. At the bottom of the screen a new number button 186, an amend number button 188 and an update telephone book button 190 are provided. Also displayed on the screen is a pointer 192 for controlling the selection of displayed items.

If the user selects the scroll bar 181 next to the window 180 the user interface is caused to display a different selection of entries in the user's telephone book. If a user selects one of the entries displayed in the window 180 this entry is highlighted (as illustrated for the entry for "DAVID"). If the user selects the name window 182, any keystrokes made by the user are caused to be displayed within the name window 182. Similarly, if the user selects the number window 184 any keystrokes made by the user are displayed within the number window 184.

If the user wishes to add a new number to their user telephone book, then the user must input the new name and number via the name and number windows 182 and 184 respectively and then select the new number button 186 which causes the name displayed in the name window 182

and the number displayed in the number window 184 to be stored in a memory of the PC 19 together with data indicating that the name and number are to be included into the user's telephone book.

5

If a user wishes to amend an existing entry in his user telephone book, then the user must scroll through the entries displayed in window 180 until the entry which is to be amended is displayed. The user must then highlight the entry to be amended and then make the required amendments in the name and number windows 182 and 184. The user then selects the amend number button 188 which causes the amended name displayed within the name window 182 and the amended number displayed within the number window 184 to be stored in memory together with data indicating that this data is to replace the highlighted entry in the user's telephone book.

10

15

When the user has added the desired number of new entries and amended any existing entries, the user can then select the update telephone book button 190 which causes the data stored within the memory of the PC 19 to be sent via the LAN 21 to the user interface module 33 where it is used to update the relevant user telephone book stored in the telephone book database 35.

20

25

If a user selects the update rules button 156 from the initial user interface, then the user interface module 33 causes an update rules interface to be generated and despatched to the user's PC 19 via the LAN 21. Figure 8 is an exemplary illustration of an update rules interface generated by the user interface module 33. As shown, the update rules interface comprises a title 200 indicating the user who created the rules. Beneath the title 200

30

are a series of user rules 202. As shown, each of the user rules 202 is in the format of a rule number followed by the word "if" and then a window for entering a name or a telephone number followed by the word "calls" followed by two further windows, one for entering a day or a date and another for entering a time period on that day or date, followed by the word "try" then a window for entering an action or a telephone number or alias (name) associated with a telephone number then the word "for" then a window for entering a time period then the word "else" and then a window for entering a number corresponding to one of the other rules displayed within the user rules update interface. Beneath the displayed list of user rules 202 there is a default rule 203 which reads: "If ANYONE calls ANY DAY ANY TIME try" and then a window for an action, telephone number or alias for a telephone number to be entered, and then the words "for" EVER". Beneath the default rule 203 four buttons are displayed: an insert rule button 205, a delete rule button 207, a sort rules button 209 and an update rules button 211. Also displayed as part of the user interface is a pointer 213 for selecting displayed windows and buttons.

By displaying all of the rules in the format of "If someone or a particular number calls within a particular time period try a certain action for a certain time period or else utilise another rule", a standard form for entering rules for use by the call routing system 25 is provided. This predefined format together with the interaction of the conversion module 37 with the conversion dictionary database 39 and the user telephone book database 35, enables the rules to be input by the user using natural language sentences. This therefore

facilitates the setting up of the rules and minimises errors.

If the user wishes to amend a displayed rule, then the user simply selects one of the windows of that rule using the keyboard or mouse of the PC 19 and then enters new data into that window via the keyboard of the PC 19. The entered data is then displayed in the window and also stored in the memory of the PC 19 for later dispatch to the telephone management system 17 as will be described later.

If the user wishes to insert a rule, then the user selects the insert rule button 205. This causes a new rule to appear between the last of the rules 202 and the default rule 203 in which each of the windows associated with that rule appear blank. The user can then input the appropriate information into the windows of the new rule via the keyboard of the PC 19. In this embodiment, there is no limit to the number of rules which the user can add.

In this embodiment, if the user selects the sort rules button 209 then this causes the rules appearing on the user interface to be reordered so that the most specific rules appear at the top of the screen and the more general rules appear lower down on the screen. In this embodiment, this is achieved by sorting the rules firstly on the basis of to whom they apply to and then by the time frame on which they are to be applied. For example the rules applying to specific individuals are ordered so as to appear first whilst rules of general applicability appear lower down. In particular, the rules for specific individuals or groups of individuals which are to apply

- on a specific date appear before rules which are to be applied on a certain day of the week which in turn appear before rules which are to be applied for more than one day of the week. Rules applicable to the same groups of individuals on the same date, day or set of days, are then ordered so that those applying for earlier time periods appear before those applying for later time periods etc.
- 10 Where two or more rules apply to the same individuals at the same time period and where one of those rules refers to the other, the rule which is referred to appears after the other rule. Thus for example in the user interface shown in Figure 8 rule 2 and rule 3 both relate to
- 15 telephone calls made by DAVID received on MONDAY.MORNING. However as rule 2 refers to rule 3 as an alternative action if rule 2 is not successful the interface sorts the rules so that rule 2 appears above rule 3.
- 20 When the user has made the desired amendments and/or additions to the rules, then by selecting the update rules button 211 causes the input updated rules data to be despatched to the user interface module 33 of the telephone management system 17 via the LAN 21. When the
- 25 user interface module 33 receives the updated rules data from the LAN 21, the user interface module 33 initially sorts the updated rules data in the same manner as previously described and then passes the sorted rules data to the conversion module 37 for conversion into user
- 30 records for storage in the rules database 29. The conversion by the conversion module 37 is achieved by converting each of the items of update rules data corresponding to entries in the windows in the update interface into numbers on the basis of the conversion

data within the conversion dictionary database 39 and the user's telephone book database 35.

The way in which this conversion is achieved in this  
5 embodiment will now be described in more detail. In this  
embodiment, the conversion module 37 is arranged to  
generate a user record corresponding to the user rules  
data input received from the user interface module 33  
step by step, converting the data input in each of the  
10 windows in the user interface into an entry in a user  
record in the rules database 29. This conversion is  
achieved initially by obtaining the user number 42 for  
the user record corresponding to the user name and user  
ID received by the user interface module 33 and by  
15 comparing the updated rules data received from the user  
input interface module 33 with entries in the user's  
telephone book record and also with the conversion data  
stored in the conversion dictionary database 39. When all  
of the input data has been converted the conversion  
20 module 37 then generates a default record corresponding  
to the default rule utilising standard definitions for  
caller ID 74, time frame 76, and time out 80 so that the  
default rule has general applicability to all calls where  
no other rule applies.

25 Thus for example in the case of processing the first rule  
of the set of rules shown in Figure 8, which states that  
"if NICK calls 12 OCTOBER 1999 ANY TIME try BUSY SIGNAL  
for EVER else ....., " the conversion module would  
30 initially retrieve from the user telephone book database  
35 the user telephone book for the user for whom user  
records are to be generated. The conversion module 37  
then identifies and stores the user number 43  
corresponding to the default telephone number for that



user from his telephone book. The conversion module 37 then identifies the telephone number 47 corresponding to the name 46 NICK stored within the user's telephone book and stores this number. The conversion module 37 then  
5 utilises the conversion dictionary database 39 to convert any of the entries of the time frame windows into the corresponding time frame data which is also stored. Thus in this example the time frame data generated would be 12/10/99 0:00:00 - 23:59:59, being time frame data  
10 corresponding to specified period "12 OCT 1999 ANYTIME".

The conversion module 37 then utilises both the conversion dictionary database 39 and the user telephone book to convert the action required either into a  
15 telephone number of a telephone to which the calls are to be directed or into some signalling information, depending on the typed user rule. In the present example the term "BUSY SIGNAL" would be converted into a command for instructing the PBX 11 to generate a busy signal.

20 The conversion module 37 then generates data for the time out period defined by the user rule. In this example, since the busy signal is being applied, no time out period is provided so that the busy signal is always  
25 supplied until the caller hangs up.

The conversion module 37 then generates data which identifies the next user record to try. In the present example, the input in the user interface has been left  
30 blank since no other rule should be used. If an entry for the next user record had been entered, the conversion module would convert this entry into the user record number corresponding to that rule number and store this

data as the next record entry 82 in the user record to be generated.

5 After processing the data in a current user rule, the conversion module 37 then generates a user record on the basis of the stored data. The conversion module 37 then generates user records for the other user rules input via the user interface in a similar manner. The conversion module 37 then instructs the rules database 29 to delete  
10 all previously stored user records for that user and then stores the newly generated user records for that user.

When a set of user records is to be retrieved from the rules database 29 by the conversion module 37 the reverse  
15 process occurs. Thus by providing means for converting user records between the format required by the rules database 29 and the format for display by the user interface, the user records stored within the rules database 29 can be tailored to be in a format in which  
20 real time data retrieval is simple and which ensures that at least one record will apply for all users of the system in all circumstances and in a format which is simple and easy to use by the user.

25 A more detailed description of the operation of the call routing system 25 will now be given with reference to Figure 9 which shows a flow diagram illustrating the control steps performed by the call routing system 25. Initially the call routing system 25 waits (S1) until the destination number and caller ID for an incoming call is  
30 received from the PBX 11. The call routing system 25 then retrieves (S2), from the rule database 29, the lowest numbered user record whose user ID 72 corresponds to the requested destination number and whose caller ID

74 corresponds to the received caller ID data and for which the time frame 76 contains the day or date and time indicated by the clock data received from the clock 27.

5 When this user record has been retrieved from the rules database 29 the call routing system 25 then outputs (S3) configuration data to the PBX 11 corresponding to the required actions 78 identified by the retrieved user record. The call routing system 25 then stores (S4) the  
10 current time and action taken. The call routing system 25 then awaits the receipt of status data from the PBX 11. If the call routing system 25 receives (S5) status data from the PBX 11 indicating that the requested number is either busy or not available, then the call routing  
15 system 25 automatically instructs the retrieval (S6) of the next user record 82 identified by the current user record and then the processing returns to step S3.

If the status data received from the PBX 11 does not  
20 indicate that the requested number is busy or not available then the call routing system 25 determines (S7) whether the current time indicated by the clock 27 is beyond the time out period 80 of the current user record. If the time out period has been reached, then the call  
25 routing system 25 causes (S6) the next user record 82 identified by the current user record to be retrieved from the rules database 29 and then the processing returns to step S3. If the call routing system 25 determines that the time out period has not yet been  
30 reached, then the call routing system 25 determines (S8) if the status data received from the PBX 11 indicates that the call has been answered. If the call has been answered then the time of receipt of this information is stored (S9) and the call routing system 25 then monitors

(S10) the status data received from the PBX 11 until the status data indicates that the call has ended. When the call routing system 25 determines that the call has ended the time at which the call ends is stored (S11) together  
5 with the recorded data regarding how the received telephone call has been processed by the PBX 11, in the call logging database 31 of the telephone management system 17.

10 If the call routing system 25 determines (S8) that the telephone call has not yet been answered, then the call routing system 25 determines (S12) whether the status data received from the PBX 11 indicates that the call has ended without any answer being received. If the status  
15 data indicates that the call is still in progress then the processing returns to step S5. If the call routing system 25 determines (S12) that the call has ended, then the time at which the call ends is recorded and stored (S11) together with the data relating to how the call has  
20 been processed in the call logging database 31 of the telephone management system 17. The processing associated with the current call then ends.

As those skilled in the art will appreciate, several  
25 incoming calls and outgoing calls will be routed through the PBX 11 at the same time. Therefore, the telephone management system 17 must monitor the progress of each of these calls.

30 Figures 10 and 11 are timing diagrams illustrating the signalling performed between the PSTN 3 and the PBX 11 during the processing of an incoming call, which illustrates the control of the call routing performed by the telephone management system 17 of Figure 1. The

25

timing diagram shown in Figure 10 corresponds to the processing of a telephone call where a user has requested that initially a call is connected to a first number and if this is not answered within a set period a second  
5 number is tried. In this example, the call is answered at the second destination because no answer is obtained from the first destination.

Initially the caller connects to the public switching  
10 telephone network 3 by inputting (t0) the telephone number of a desired user. The PSTN 3 passes (t1) the requested telephone number and caller identification data to the PBX 11 corresponding to the input number. At the same time a voice connection is made between the caller  
15 and the PSTN 3. When the PBX 11 receives (t2) the destination number and the caller identification data, this is initially passed to the telephone management system 17. At this time a voice connection is made between the PSTN 3 and the PBX 11.

20 When the telephone management system 17 receives (t3) this data the telephone management system 17 then processes the destination number, caller ID and clock data to identify a user record within the rules database  
25 29 to determine the control action to be taken by the PBX 11. In this case, the routing instruction sent to the PBX 11 is to ring the telephone number corresponding to the first destination. This destination could be one of the office telephones 13, one of the voice mail boxes 15  
30 or it could be a destination outside of the office such as a mobile telephone 7 or a home telephone 9.

When this instruction is received (t4) by the PBX 11, the PBX 11 then passes a signal indicating that the telephone

is ringing to the PSTN 3 which is then conveyed (t5) back to the caller. At the same time (t4) the PBX 11 causes a ring instruction to be sent to the telephone at the first destination to cause that telephone to ring and for  
5 a voice connection to be made between the PBX 11 and the first destination telephone.

Whilst the instruction to ring is being processed the telephone management system 17 monitors the status of the  
10 call to the first destination telephone. If a time period (t6-t3) beyond the time out period for the retrieved user record is exceeded, then the telephone management system 17 retrieves a further user record from the rules database and sends (t6) a second routing  
15 instruction to the PBX 11. This initiates the removal of the voice connection between the PBX 11 and the first destination telephone and initiates the setting up of a second voice connection to the second destination telephone. At the same time (t7) a ringing tone is sent  
20 from the PBX 11 to the PSTN 3 which is then transferred (t8) to the caller's telephone 5.

When the second destination telephone is answered (t9), this is signalled back to the PBX 11 which then  
25 transfers (t10) that information to the telephone management system 17. This prevents the telephone management system 17 from sending further configuration data to the PBX 11. When the telephone call has finished (t11), a hang-up signal is sent from the second  
30 destination telephone to the PBX 11 which is then transferred (t12) to the telephone management system 17 to record the end of the telephone call.

As can be seen from Figure 10 the processing of the telephone management system 17 is transparent to a caller into the system. It is not apparent to the caller whether the telephone which is answered corresponds to the first telephone which is contacted or corresponds to the subsequent telephone which is answered. Furthermore, as the telephone management system 17 can instruct the PBX 11 to initiate the creation of telephone links to external telephones, the final destination of a telephone call need not be within the office. However, since it is the PBX 11 which initiates the set up of such external telephone links, a caller into the office will not be charged for the creation of an additional telephone link and hence will only be billed by the service provider for a single telephone call (with the cost for the second telephone link being borne by the office).

Figure 11 is a timing diagram of an alternative scenario for the answering of an incoming telephone call. The scenario illustrated in Figure 11 is identical to the example of Figure 10 except that in this example the first destination telephone is already connected to the PBX 11 on another call.

In this example, when the telephone management system 17 instructs the PBX to route the incoming call to the first destination telephone, the PBX 11 can then automatically transmit (t4) a busy signal back to the telephone management system 17 since the PBX 11 knows that the first destination telephone is already on a call. This busy signal is then received (t5) by the telephone management system 17 which causes a further user record to be retrieved from the rules database 29 and a corresponding routing instruction to be sent (t5) to the

- 5 PBX 11. In this way when a telephone number is unavailable the call can automatically be transferred to another number without a period of time corresponding to the time out period having to pass before a connection to the alternate destination is initiated. The remaining timings for this example are the same as for the example described with reference to Figure 2 and will not, therefore, be described again.
- 10 The processing of incoming calls in accordance with caller ID, requested destination and time and date enables calls to be selectively diverted as and when appropriate. Thus, for example, calls from some individuals could be diverted to other telephones or to
- 15 voice mail when a user does not wish to be disturbed, whilst certain individuals whose telephone calls are felt to be more important would be allowed to be passed through allowing the user to be contacted.
- 20 By also allowing the telephone management system 17 to request that the PBX 11 issue busy signals, or number not available signals certain callers could be prevented from contacting anyone within the office.
- 25 By associating a PC 19 with an office telephone 13 users are placed to tailor their exact telephone routing requirements. The provision of specified user interfaces enables such requirements to be input into the system in a simple manner, thus making the system easy to use. If
- 30 a user's requirements change, the routing preferences may easily and rapidly be updated.

The logging of the processing of calls by the call routing system 25 within the call logging database 31 of



the telephone management system 17 enables the processing of calls to be monitored either by a user via the user interface module 33 or centrally via the administration module 41.

5

A second embodiment of the present invention will now be described. Figure 12 is a block diagram of a second embodiment of the present invention. In the first embodiment a system was described in which the present invention is implemented as part of an office communications network 1. In this embodiment, the present invention is implemented as part of a public telephone switching network.

15 In accordance with this embodiment of the present invention a public switching telephone network (PSTN) 300 comprising a number of public switching telephone network switches 302 is provided. Each of the public switching telephone network switches 302 are connected to a number  
20 of telephones 304 as well as to each other. When the user of one telephone wishes to connect to another user, the telephone call is initially routed through the caller's local exchange (one of the PSTN switches 302) and then either connected directly to another telephone  
25 304 connected to the local exchange or connected to other telephones 304 via other PSTN switches 302.

In this embodiment a telephone management system 310 is connected to each of the PSTN switches 302 of the public switching telephone network 300. The PSTN switches 302  
30 are then arranged to route requests for connecting to some destinations (users or subscribers) to the telephone management system 310, which then selects and outputs routing instructions in the same manner as has been

described in relation to the first embodiment. The telephone management system 310 of this embodiment is then arranged to monitor and dispatch further routing instructions to the PSTN switches 302 in the same way in which the telephone management system 17 of the previous embodiment was arranged to monitor and despatch further routing instructions to the PBX 11 in the previous embodiment.

As shown in Figure 12, the telephone management system 310 in this embodiment is connected via the internet 312 to a number of personal computers 314. As a result, users or subscribers can access the telephone management system 310 using any personal computer 314 via the Internet 312 to update their user records and/or telephone books. In this way, the users can automatically reconfigure their call routing settings stored within the telephone management system 310 without having to do so via a human operator.

Although in the previous embodiments data input has been described in relation to text data input to user interfaces via displays on the screens of personal computers, other means of inputting user preference rules into a telephone management system could be used. For example the input and control of rules could be performed utilizing voice controls. Alternatively, a touch tone telephone could be used to generate short codes to enable the user to be able to select a set of predefined user preference rules, rather than have to input each rule sequentially.

Although in the previous embodiments systems have been described in which a single set of user rules is provided

for each user, multiple sets of user records could be stored within the telephone management system and users could select from those stored sets of user records, which ones are to be applied at a current time. Thus, 5 for example, one set of user records could be utilised when the user is at work and another set of user records could be used when the user is at home or on holiday. The set of user records to be utilised by the telephone management system could then be selected by the user with 10 the other set of user records being stored for later use.

Although the previously described embodiments refer to the routing of telephone calls on the basis of caller ID, destination and time, other data could be used in 15 addition to or instead of this data to determine the routing of a telephone call. Thus, for example, different user records could be included within the rules database to handle data and fax calls. Alternatively, other inputs could be used to determine the routing of a 20 call. For example where calls to a call centre are received from a number of different countries, the language of callers from that country could be used to divert that call to a user who can answer that telephone call in the expected languages. Alternatively, the 25 telephone management system could be arranged to receive data indicative of the location of a person who is being called and the location information could be utilised to direct a call to the nearest telephone. Such data could either be obtained utilising a signal from a badge worn 30 by a user, or alternatively the location of a user could be determined by obtaining signals for users logging onto computers or using swipe cards to move about an office. By arranging the telephone management system to receive such signals and providing the telephone management

system with information about the relative location of telephones, the telephone management system could be arranged to route a call to the telephone closest to a desired user.

5

Although in the previously described embodiment the present invention has been described in terms of user configuration of the routing of incoming or internal telephone calls, the present invention could also be used to control the processing of outgoing telephone calls. Thus, for example, user records could be entered into the database to prevent certain types of calls or certain telephone numbers being accessed from telephones within a company or on the public network. The telephone management system could also be provided with further user records relating to how outgoing calls are to be routed, for example user records could be input determining the routing of calls on the basis of cost.

20 Although the present invention has been described in terms of rerouting telephone calls, other services for handling telephone calls could also be incorporated and utilised such as call waiting and ring back or call back when free could be utilised by the present invention.

25 The present invention also applies to multi-party conference calls created using the system. Thus for example a request to set up a conference call could be processed by the present system. The present invention is also applicable to data transfers and fax data sent via

30 a telephone network.

Although the present application has been described with the user's telephone book as a distinct part of the telephone management system, the user telephone book

records could be part of other systems with the telephone book data being transferred to the telephone management system when appropriate. Alternatively, the user's telephone book could also be linked to meeting scheduling and diary software which could be used to generate certain rules for automatic inclusion within the rules database 29 to account for the schedule of meetings for a user. The telephone management system could also be arranged to generate user records automatically on the basis of monitoring the call records to determine where calls are in fact answered. In this way the telephone management system could be arranged to determine for each user the most efficient way to contact that user at particular times or in particular circumstance indicated by the received signals.

Although in the previous embodiments a user interface module 33 has been described which generates user interfaces having a fixed format, a telephone management system 17 could be provided in which an administration module was arranged to enable different user interfaces to be created and sent to users. In this way the user interfaces generated by a user interface module could be modified to correspond to a particular corporate appearance. Furthermore, the modification of user interfaces could provide an additional channel of communication to users, as any information displayed as part of the user interfaces would be brought to the attention of users whenever they modified the preferred routing for their calls. This additional channel of communication therefore providing advertising space which the service provider could use or sell.

Although in the embodiments a call routing system is described which is arranged only to output configuration data to a communications switch, additional outputs could be made by the call routing system. Thus for example the

5 call routing system could be arranged to output a signal to be sent as an e-mail whenever a call is transferred to a voice mail box so that users could receive an e-mail informing them that a voice mail message had been received. Alternatively, the call routing system could

10 be arranged to monitor the receipt of e-mail by users and be arranged to generate the recording of a voice mail message or the automatic generation of telephone messages informing those users that they have received e-mail.

15 Although the embodiments of the invention described with reference to the drawings comprise computer apparatus and processes performed in computer apparatus, the invention also extends to computer programs, particularly computer

20 programs on or in a carrier adapted for putting the invention into practice. The program may be in the form of source or object code or in any other form suitable for the implementation of processes according to the invention. The carrier may be any entity or device capable of carrying the program.

25 For example, the carrier may comprise a storage medium, such as a ROM, for example a CD ROM or a semiconductor ROM, or a magnetic recording medium for example a floppy disc or hard disc. Further, the carrier may be a

30 transmissible carrier such as an electrical or optical signal which can be conveyed via electrical or optical cable or by radio or other means.

When a program is embodied in a signal which may be conveyed directly by a cable or other device or means, the carrier may be constituted by such cable or other device or means.

5

Alternatively, the carrier may be an integrated circuit in which the program is embedded, the integrated circuit being adapted for performing, or for use in the performance of the relevant processes.

CLAIMS:

1. An apparatus for controlling the routing of communications through a communication switch comprising:
  - 5 first receiving means for receiving a signal indicative of the origin of a current communication to be routed through said switch;
  - second receiving means for receiving a signal indicative of a user to which the current communication
  - 10 is to be routed;
  - third receiving means for receiving a signal indicative of the current time;
  - a database for storing for each of a plurality of users, control action records associating control actions
  - 15 with different combinations of signals received by said first, second and third receiving means;
  - means for generating a routing control signal associated with a selected control action, selected using said stored control action records and the signals
  - 20 received for said current communication from said first, second and a signal indicative of the current time received from said third receiving means;
  - means for outputting said routing control signal to said switch for controlling the routing of said
  - 25 communication through said switch;
  - user interface means for receiving from any of said users, user routing instructions that define for that user control action records associating desired control actions with different combinations of signals received
  - 30 by said first, second and third receiving means; and
  - means for updating said database using said received user routing instructions.
2. Apparatus in accordance with claim 1, further
- 35 comprising fourth receiving means for receiving a signal



indicative of the status of a current communication routed through said switch and wherein said means for generating a routing control signal is arranged to generate further routing control signals for rerouting  
5 said communication, said routing control signals being associated with selected control actions, selected using said stored control action records and signals received from said first, second, third and fourth receiving means.

10

3. Apparatus in accordance with claim 2, wherein said means for generating a routing control signal is arranged to generate a further routing control signal, upon receipt by said fourth receiving means of a signal  
15 indicating that a specified destination is busy or not available.

20

4. Apparatus in accordance with claim 2, wherein said database is arranged to associate time out periods with said control action records, wherein said means for generating a routing control signal is arranged to record the time of generation routing control signals and is arranged to generate a further routing control signal for rerouting said current communication, if said fourth  
25 receiving means fails to receive a signal indicating a call has been answered within said time out period from said recorded time.

30

5. Apparatus in accordance with claim 3 or 4, wherein a current control action record identifies another control action records and wherein said means for generating a routing control signal is arranged to generate said further routing control signals associated with the control action record identified by said current  
35 control action record.

6. Apparatus in accordance with claim 5, wherein said database is arranged to associate a default control action record with all combinations of signals from said first, second and third receiving means.

5

7. Apparatus in accordance with any preceding claim, wherein said means for generating a routing control signal is arranged to generate routing control signals either for configuring said switch to connect said current communication to a specified destination or to output a signal to the origin of said current communication.

10

8. Apparatus in accordance with any preceding claim, wherein said user interface update means comprises means for converting said routing instructions into records for storage in said database.

15

9. Apparatus in accordance with claim 8, wherein said means for converting comprises means for associating text data with caller ID data corresponding to signals or groups of signals indicative of the origin or destination for a call received by said first or second receiving means.

20

25

10. Apparatus in accordance with claim 8 or claim 9, wherein said conversion means comprises means for associating text data with time periods, corresponding to groups of signals indicative of a current time received by said third receiving means.

30

11. Apparatus in accordance with any preceding claim wherein said user interface means is arranged to output a user interface to prompt users to input settings in a predefined format.

35

12. Apparatus in accordance with claim 11, wherein said user interface is arranged to prompt users to input settings in the form of statements that if a call is received from a specified origin a certain action is required.

13. Apparatus in accordance with claim 12, wherein said user interface is arranged further to prompt users to input settings corresponding to an alternative course of action if a time out occurs.

14. Apparatus in accordance with claim 13, wherein said user interface is arranged to prompt users to input settings in the format if a call is received from a specified origin a certain action is required for a time out period else an alternative action is to be tried.

15. Apparatus in accordance with claim 14, wherein said user interface is arranged to prompt users to input a required action for a default record.

16. Apparatus in accordance with any preceding claim, further comprising means for confirming data received by said user interface update means corresponds to an authorised user.

17. Apparatus in accordance with any preceding claim, further comprising means for recording the processing of communications routed in accordance with routing instructions outputted by said outputting means.

18. A communication routing system for routing calls comprising:

- a communication switch for routing calls;
- an apparatus for controlling routing calls in

accordance with any preceding claim; and

transmission means for transmitting control signals and signals indicative of an origin and a destination for a call between said communication switch and said apparatus for controlling routing of calls.

19. A communications system in accordance with claim 18, wherein said communications switch comprises a private branch exchange.

20. A communications system in accordance with claim 18, wherein said communications switch comprises a public switching telephone network switch.

21. A communications system in accordance with any preceding claim, further comprising input means for inputting a setting that define for that user data associating control actions with different combinations of inputs.

22. A communications system in accordance with claim 21, wherein said input means comprises a computer arranged to be connected to said user interface means via a network.

23. A communications system in accordance with claim 22, when directly or indirectly dependent on any of claims 11 to 15, wherein said computer is arranged to display said output user interfaces to prompt users to input settings in said predefined format.

24. A method of generating control signals for controlling the routing of data through a communication switch comprising the steps of:

providing means for receiving from any of a plurality of users, settings that define for that user

41

data associating control actions with different combinations of inputs;

updating said database using said settings;

5 providing a database storing for each of said plurality of users, control action records associating control actions with different combinations of received signals;

receiving a signal indicative of the origin of a current communication to be routed through said switch;

10 receiving a signal indicative of a requested destination for said communication;

receiving a signal indicative of the current time;

generating a routing control signal associated with a selected control action, selected using said stored control action records and inputs received from said first, second and third receiving means; and

15 outputting said control signal to said switch.

25. A method in accordance with claim 24, further comprising the steps of receiving a signal indicative of the status of a current communication routed through said switch, and generating further routing control signals for rerouting said communication, said further routing control signals being selected using said stored control action records and received inputs.

26. A method in accordance with claim 25, wherein said further routing control signal is generated, upon receipt of a signal indicative a destination is busy or not available.

27. A method in accordance with claim 25, wherein said database is arranged to associate time out periods with said control action records, further comprising the steps of:

recording the time of generation routing control signals; and

generating a further routing control signal for routing said current communication, if a signal  
5 indicating a call has been answered within said time out period from said recorded time is not received.

28. A method in accordance with claim 26 or 27, wherein said database is arranged to associate each of said  
10 control actions records with one of the other control action records wherein said step of generating a further control signals comprises generating said control signal associated with the control action of said other of said control action records.

15 29. A method in accordance with any of claims 24 to 28, wherein said step of generating a routing control signal comprises generating a routing control signal either for configuring said switch to connect said current  
20 communication to a destination, or to output a signal to said origin of said current communication.

30. A method in accordance with any of claims 24 to 29, further comprising the step of:  
25 converting data indicative of received user preferences into records for storage in said database.

31. A method according to claim 30, wherein said conversion step comprises converting text data into  
30 caller ID data corresponding to signals or groups of signals indicative of the origin or destination for a call received by said first or second receiving means.

32. A method in accordance with claim 30 or 31, wherein  
35 said conversion step comprises converting text data into

time periods, corresponding to groups of signals indicative of a current time received by said third receiving means.

- 5 33. A method in accordance with any of claims 24 to 32 further comprising the step of:

outputting a user interface to prompt users to input settings in a predefined format.

- 10 34. Apparatus in accordance with claim 33, wherein said user interface is arranged to prompt users to input settings in the form of statements that if a call is received from a specified origin a certain action is required.

- 15 35. A method in accordance with claim 34, wherein said user interface is arranged further to prompt users to input settings corresponding to an alternative course of action if a time out occurs.

- 20 36. A method in accordance with claim 35, wherein said user interface is arranged to prompt users to input settings in the format if a call is received from a specified origin a certain action is to be performed for  
25 a time out period else an alternative action is to be tried.

37. A method in accordance with claim 36, wherein said user interface is arranged to prompt users to input a  
30 required action for a default record.

38. A method in accordance with any of claims 24 to 37, further comprising the step of:

confirming data received by said user interface  
35 update means corresponds to an authorised user before

updating said database.

39. A method in accordance with any of claims 24 to 38, further comprising the step of:

- 5        recording the processing of communications routed in accordance with said output routing instructions.

40. A communication routing method for routing calls comprising the steps of:

- 10        generating control signals for controlling routing calls in accordance with the method of any of claims 24 to 39; and

          operating said switch in accordance with said generated signals.

15

41. A storage medium for storing processing implementable instructions for causing a processor to perform the method of any of claims 24 to 40.

20

42. Processor implementable instructions for causing a processor to perform the method of any of claims 24 to 40.



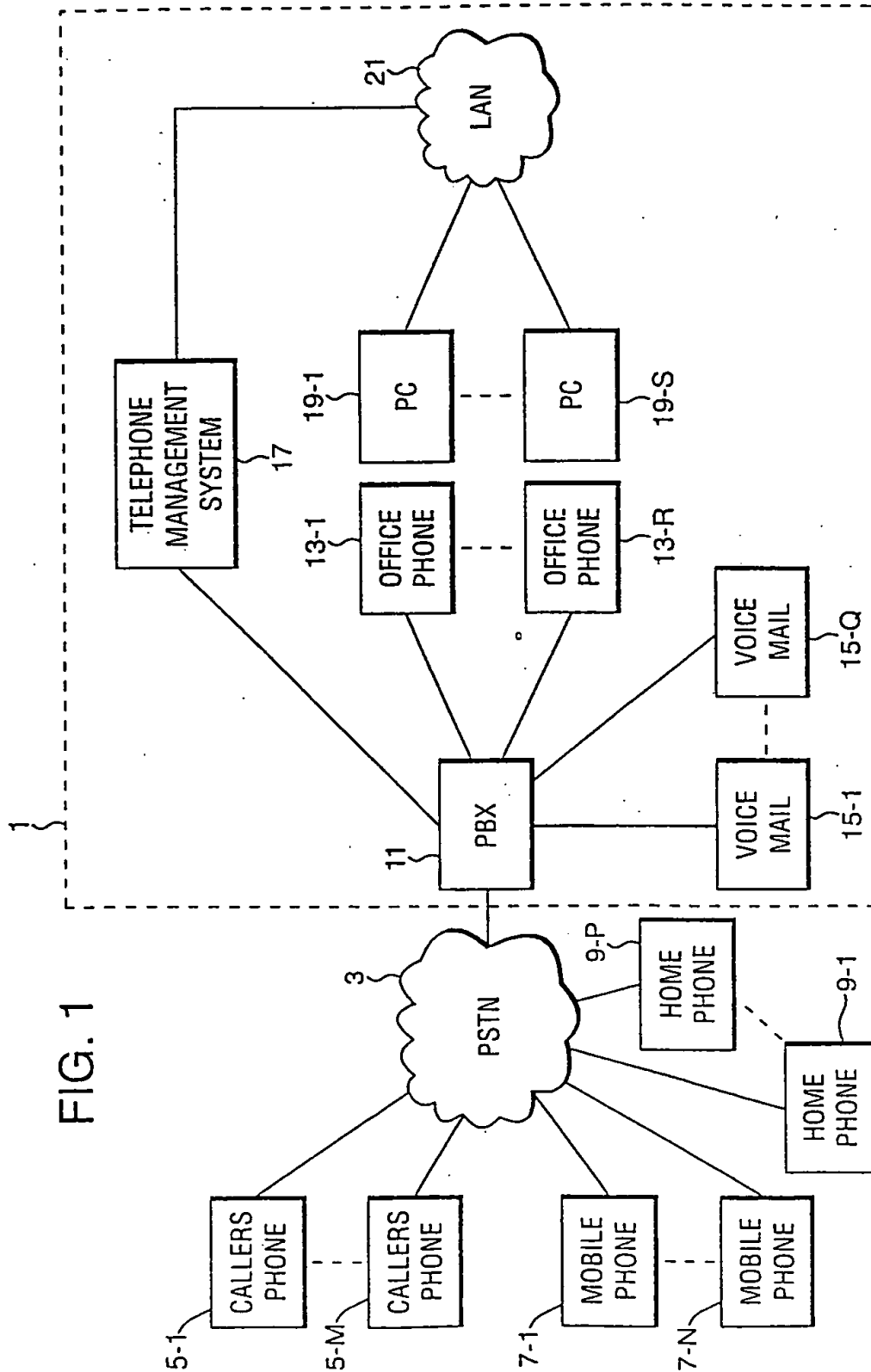


FIG. 2

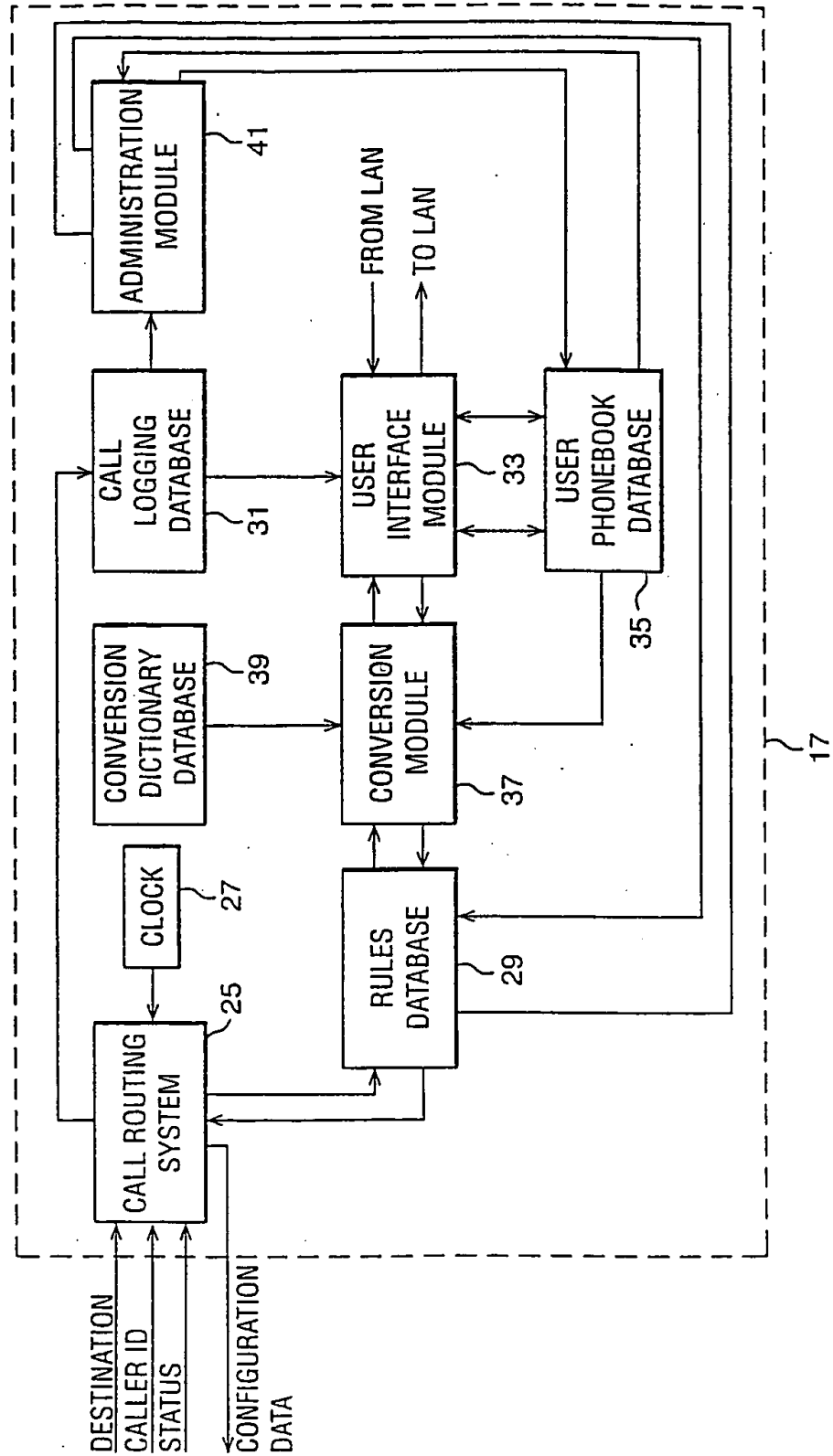


FIG. 3

RECORD NUMBER	70
USER ID	72
CALLER ID	74
TIME FRAME	76
REQUIRED ACTION	78
TIME OUT	80
NEXT RECORD	82

FIG. 4

	USER NAME	42
	USER NUMBER	43
	USER ID	44
46	NAME 1	45
47	NUMBER 1	
	⋮	
46	NAME N	45
47	NUMBER N	

FIG. 5

ANYDAY	DAY = 1,2,3,4,5,6,7	51
WEEKDAY	DAY = 1,2,3,4,5	52
WEEKEND	DAY = 6,7	53
MONDAY	DAY = 1	54
TUESDAY	DAY = 2	55
WEDNESDAY	DAY = 3	56
THURSDAY	DAY = 4	57
FRIDAY	DAY = 5	58
SATURDAY	DAY = 6	59
SUNDAY	DAY = 7	60
MORNING	TIME = 0:00:00 - 11:59:00	61
AFTERNOON	TIME = 12:00:00 - 17:00:00	62
EVENING	TIME = 17:00:01 - 23:59:59	63
ANYTIME	TIME = 0:00:00 - 23:59:59	64
BUSY SIGNAL	CONFIG = BS	65
RING TONE	CONFIG = RT	66
NOT AVAILABLE	CONFIG = N/A	67
ANYONE	USER = "*"	68

FIG. 7

ANGELA	90171 299399	181
DAVID	90123 123456	
JOHN	90158 777777	

NAME:  182

NUMBER:  184

186 NEW NUMBER

188 AMEND NUMBER

190 UPDATE PHONEBOOK

FIG. 6

USER NAME:  150

USER ID:  152

154 UPDATE PHONEBOOK

156 UPDATE RULES

158 VIEW PHONELOG

160 EXIT

FIG. 8

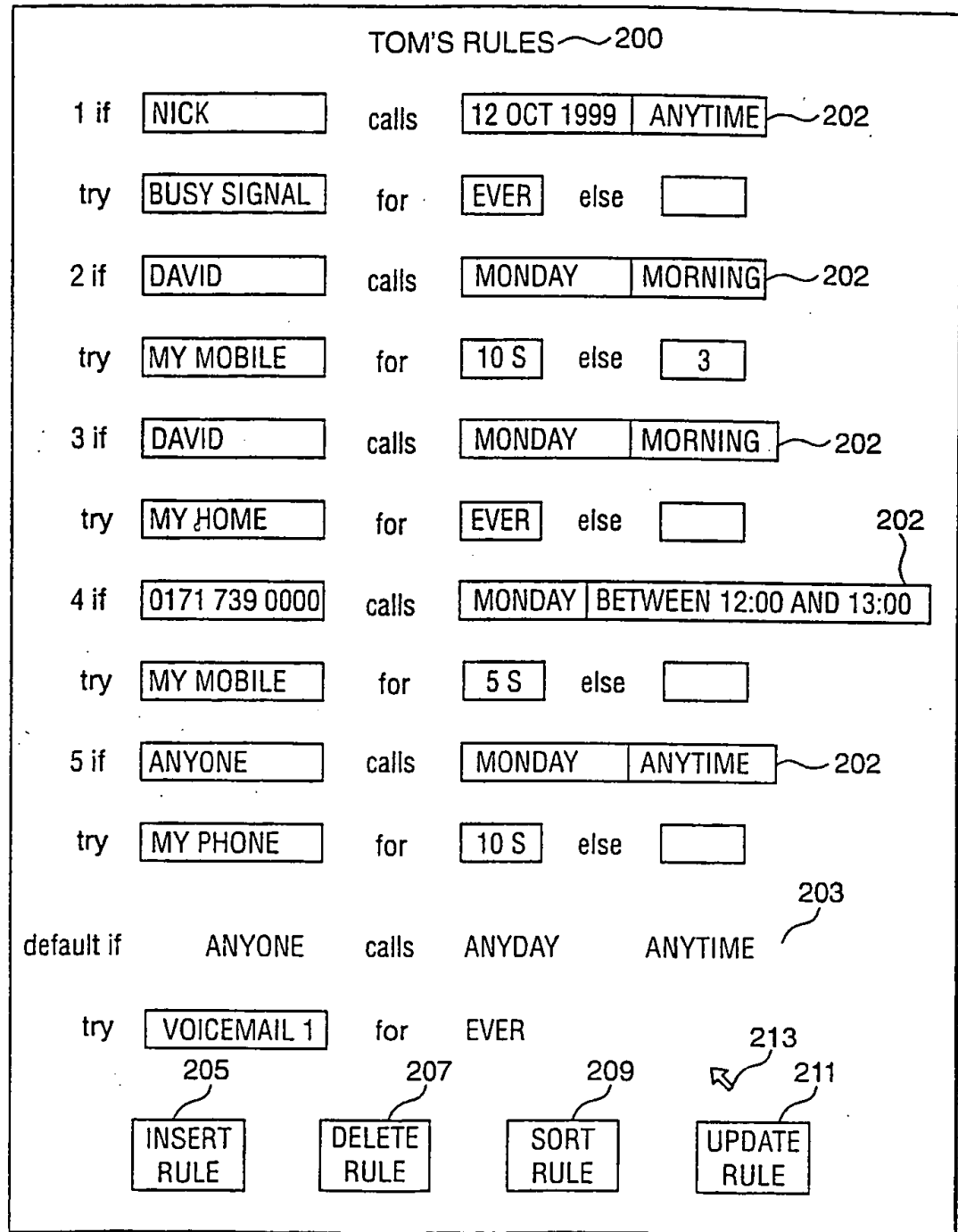
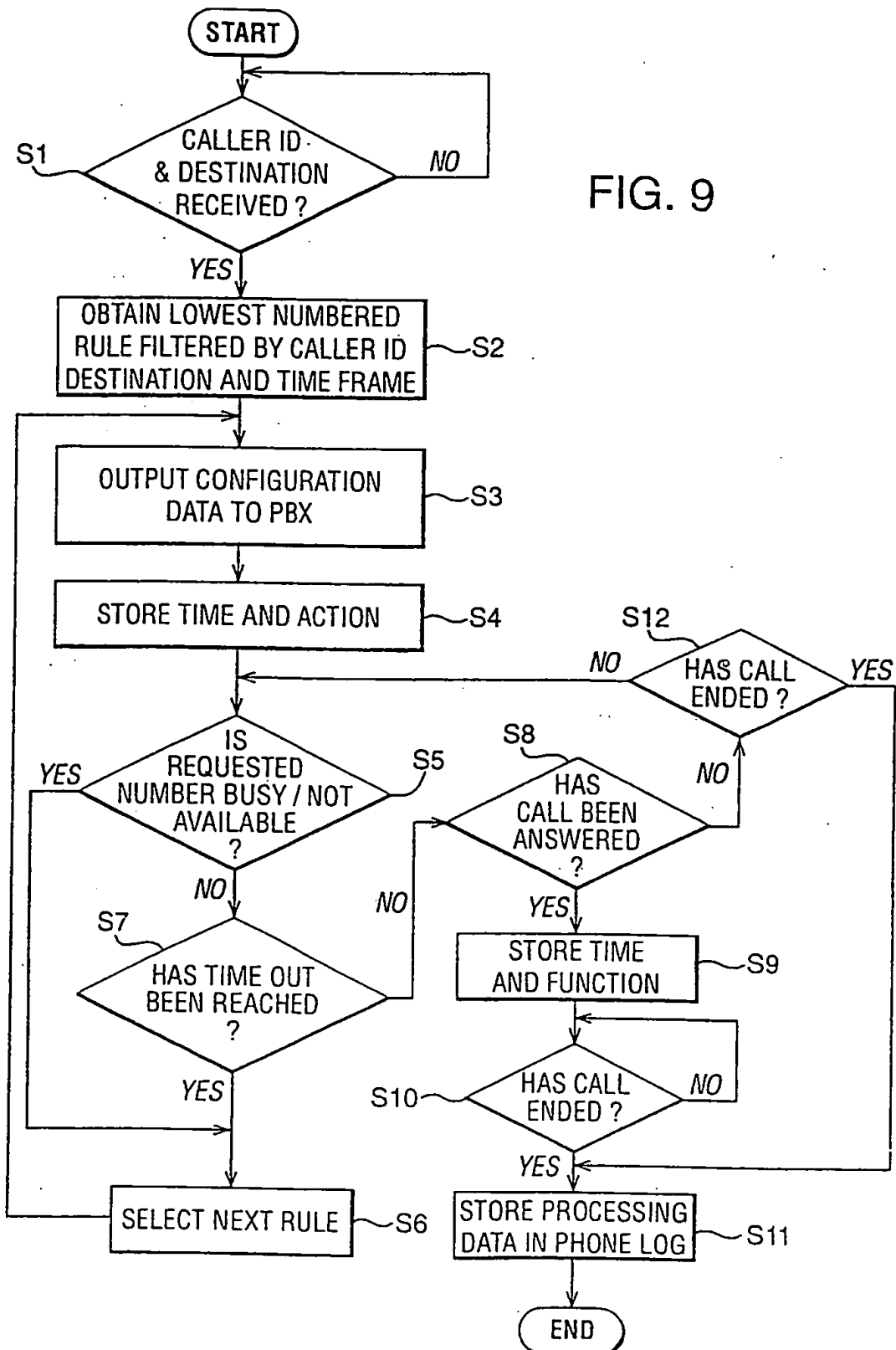


FIG. 9



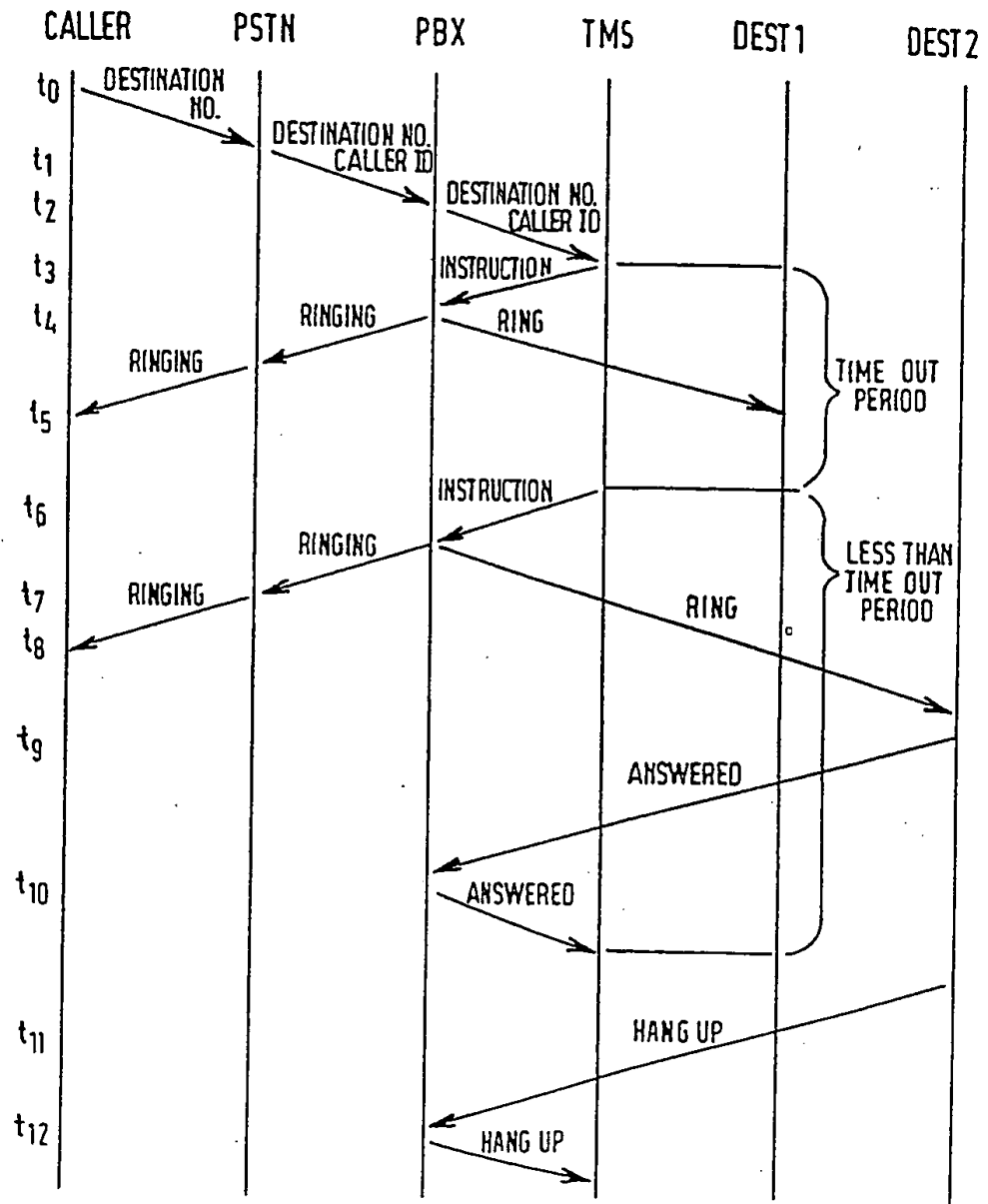


FIG. 10



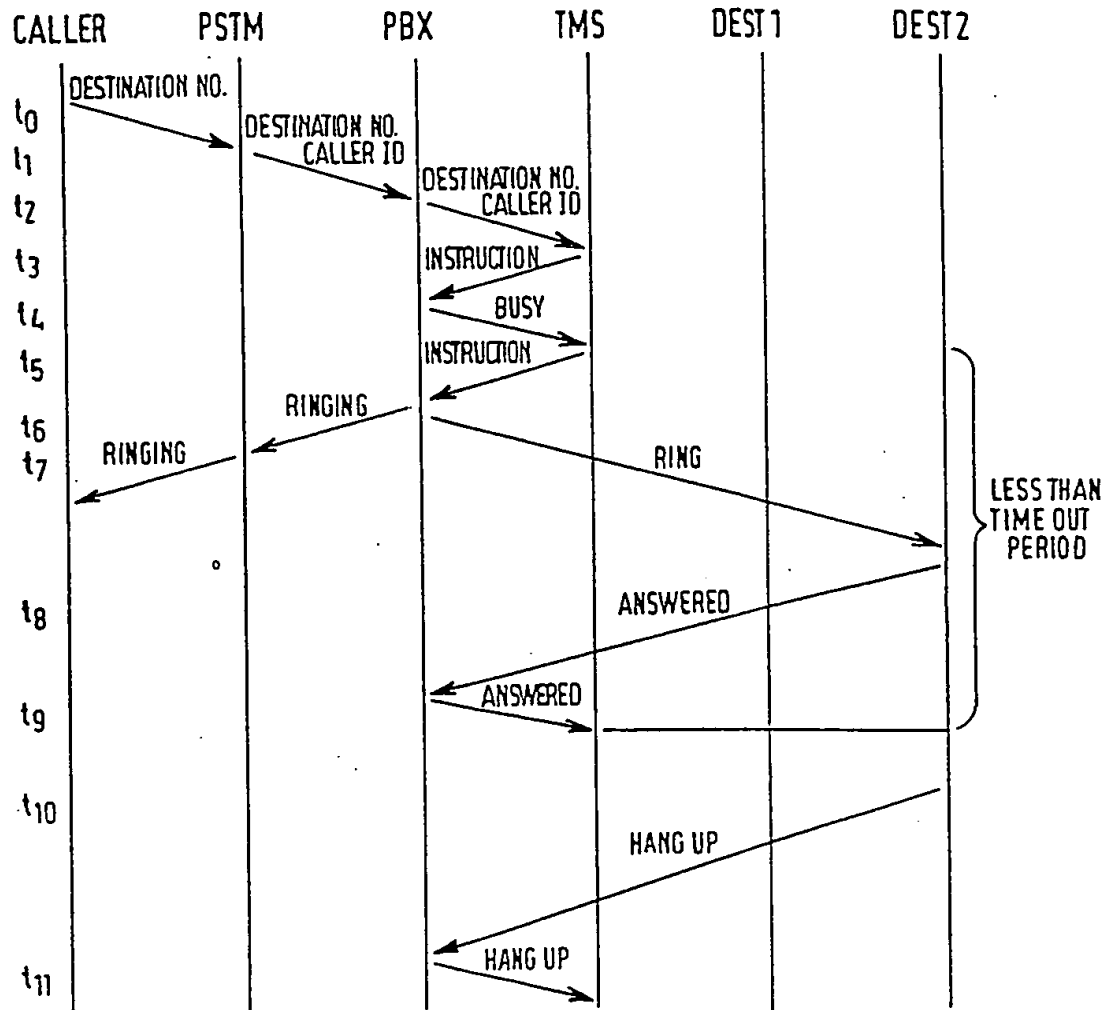
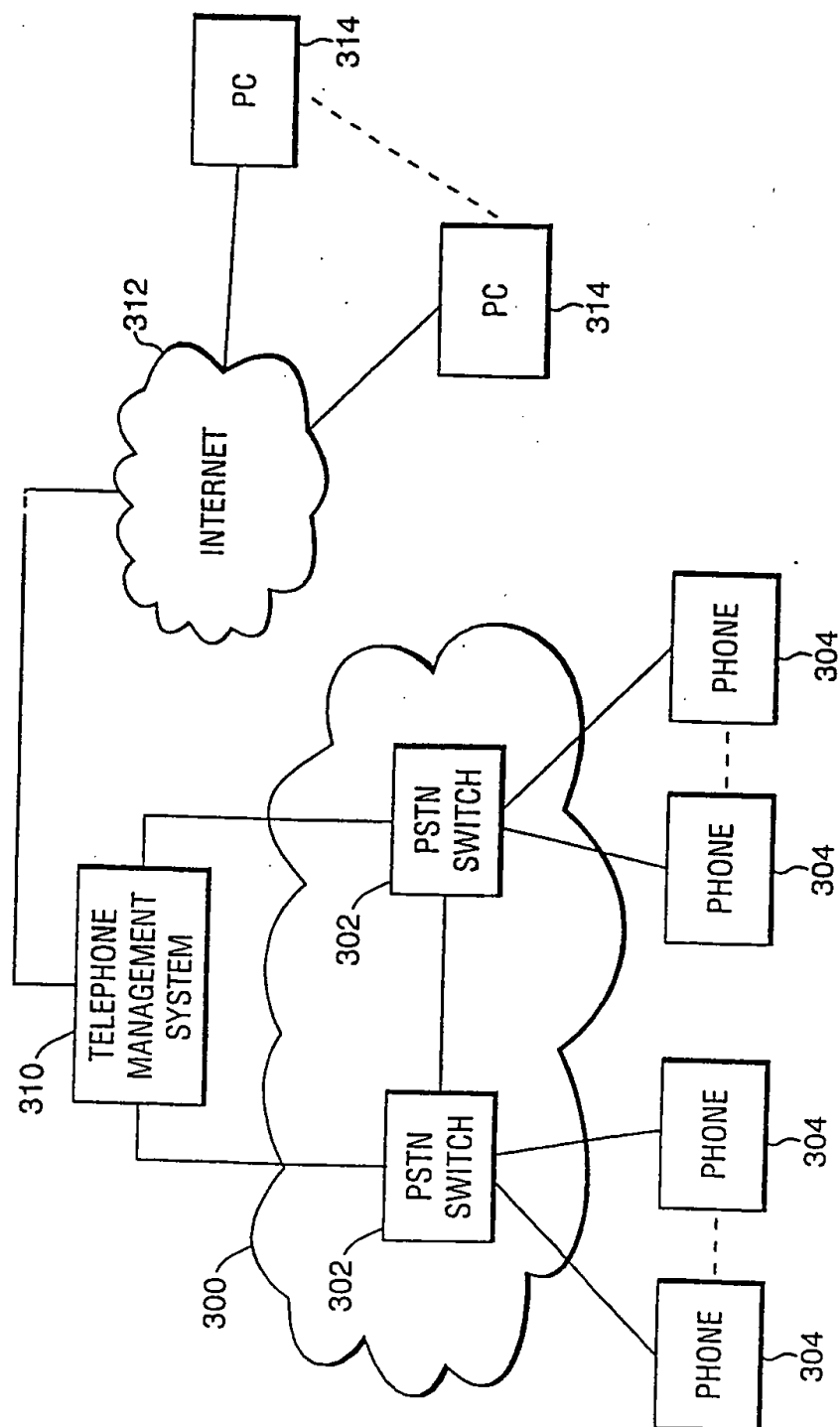


FIG. 11

FIG. 12



# INTERNATIONAL SEARCH REPORT

Int. .onal Application No  
PCT/GB 99/03390

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04M3/436 H04M3/54

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 440 620 A (SLUSKY RONALD D) 8 August 1995 (1995-08-08)	1,7-16, 18,20, 21,24, 29-38, 40-42
Y	abstract; figures 1,7-9  column 1, line 39 -column 2, line 42 column 3, line 35-57 column 16, line 57 - line 69 ---	2-6,17, 19,22, 23, 25-28,39
Y	EP 0 376 525 A (AMERICAN TELEPHONE & TELEGRAPH) 4 July 1990 (1990-07-04)  abstract; tables 1,8 page 7, line 23 -page 9, line 13 ---	2-6,17, 25,26, 28,39
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

28 January 2000

Date of mailing of the international search report

04/02/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 eport,  
Fax: (+31-70) 340-3016

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB. 99/03390

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 510 411 A (ROLM SYSTEMS) 28 October 1992 (1992-10-28) abstract page 2, line 16 - line 54 page 4, line 37 - line 43 page 8, line 10 - line 33	19
Y	US 5 329 578 A (BRENNAN PAUL M ET AL) 12 July 1994 (1994-07-12) abstract column 6, line 5 - line 42; table 2 column 7, line 26 - line 32	27
Y	WO 97 34401 A (XANTEL CORP) 18 September 1997 (1997-09-18) abstract; figures 7,9A,9B	22,23
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Information on patent family members

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